Draft - Responses to USEPA Comments on
"Area 1 Supplemental Remedial Investigation Report
Supplemental Remedial Investigations/Feasibility Studies
Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site,"
July 2012, ARCADIS

Specific Comments

Specific Comment #:1
Section: Executive Summary Page #: ES-6 Lines #: NA

The second bullet on page ES-6 of the SRI executive summary should be changed to read:

For birds, current research indicates that it is appropriate to separate them into different and identifiable categories of sensitivity, so in the TBERA, risks were assessed for high, moderate, and low sensitivity; insectivores and vermivores. The multiple lines of evidence considered support conclusions of no unacceptable risk to any moderate or low sensitivity species, and as no high sensitivity vermivores have been identified at the Site in over 30 years of surveys conducted by the Kalamazoo River Nature Center, this category is not applicable. However, the categorization of avian receptors at the site is incomplete. Estimates are that between four and 17 high sensitivity species of which some may be vermivorous could be present on site. For high sensitivity, insectivores (e.g., the grey catbird and European starling, represented by the house wren), the results were not in agreement - with one approach indicating no unacceptable risk and a second indicating likely risk.

Specific Comment #1 Response: There is no basis to assume that an unknown vermivorous bird could be present. Not only have no high sensitivity vermivores been observed at the Site (as pointed out in the text above), but also a review of the Audubon database for the State of Michigan showed that the American robin and the American woodcock were the only two predominantly vermivorous (i.e., > 40% worm in diet) terrestrial species (Table 1, attached) observed in the state. As described in the TBERA, each of these birds has had its AH receptor sequenced and was found to be Type 2 or moderately sensitive.

In addition, the quantitative analysis that is discussed below in Specific Comment #4 (and the associated response) and referred to in this comment speaks primarily to the uncertainty associated with identifying which, if any, of the species that are found at the Site may be high sensitivity. This analysis also introduces a number of variables that are not fully discussed and have significant associated uncertainty. It is therefore proposed that the quantitative evaluation of the possible number of high sensitivity species be included in the uncertainty analysis of Appendix B (see response to Specific Comment #4). Because this is primarily an uncertainty discussion and there are many other uncertainties associated with the avian risk assessment that are not discussed in the executive summary, it is proposed that reference to this specific analysis not be included in the executive summary of the SRI. Additional discussion of the analysis and reference to the number of high sensitivity species that may be present at the Site is outlined in the responses to Specific Comments #2 through #4, below.

Because high sensitivity vermivores are not expected and the quantitative analysis referenced is primarily an uncertainty discussion, it is proposed that the current language in the executive summary remain unchanged. However, if USEPA feels that this issue needs to be further addressed in the Executive Summary of the SRI, the text provided above is proposed to be modified as follows:

For birds, current research indicates that it is appropriate to separate them into different and identifiable categories of sensitivity, so in the TBERA, risks were assessed for high, moderate, and low sensitivity insectivores and vermivores. The multiple lines of evidence considered support conclusions of no unacceptable risk to any moderate or low sensitivity species. Although the categorization of avian receptors at the Site is incomplete, no high sensitivity vermivores have been identified among the large number of species observed at the Site in over 30 years of surveys conducted by the Kalamazoo River Nature Center. Moreover, the Audubon database for the state of Michigan was reviewed, and all of the birds with a predominantly vermivorous diet that have been observed in the state have been evaluated and found to be moderately sensitive. Thus, the category of high sensitivity vermivores is not applicable to the Site. For high sensitivity, insectivores (e.g., the grey catbird and European starling, represented by the house wren), the results were not in agreement – with one approach indicating no unacceptable risk and a second indicating likely risk. As the sensitivity of all species observed at the Site has not been evaluated, it is possible that other high sensitivity insectivorous, omnivorous or herbivorous species may be present. These species would not necessarily be at risk, as the risk assessment for high sensitivity insectivores represents the high end of exposure relative to omnivores and herbivores.

Specific Comment #:2

Section: 9.2.5 Pages 9-20 Lines#: 30

Please add the following sentence after the one ending with "highly sensitive vermivores are present in Area 1."

However, the categorization of avian receptors at the site is incomplete. Estimates are that between four and 17 high sensitivity species of which some may be vermivorous could be present on site.

Specific Comment #2 Response:

Consistent with the response to Specific Comment #1 above, see the proposed alternative text below:

While the AH receptor sensitivity categorization of all avian receptors at the Site is incomplete, a detailed review of Birds of North America Online*, published by Cornell Lab of Ornithology in association with the American Ornithologists Union (http://bna.birds.cornell.edu), was reviewed to verify that all of the predominantly vermivorous (i.e., > 40% earthworms in diet) terrestrial species that have been observed in the State of Michigan (as recorded by Michigan Audubon) have had their AH receptor sequenced. The AH receptor for each of these has been identified as type 2 (i.e., moderate sensitivity). Thus, the category of high sensitivity vermivores is not applicable to the Site.*

Specific Comment #:3
Section: 9.2.6 Pages 9-22 Lines#:12

Please add the following sentence after the one ending with "over 30 years of surveys conducted by the Kalamazoo River Nature Center."

However, the categorization of avian receptors at the site is incomplete. Estimates are that between four and 17 high sensitivity species of which some may be vermivorous could be present on site.

Specific Comment #3 Response:

Based on the proposed change to Section 9.2.5 (shown in the response to Specific Comment #2 above), it is proposed that that the sentence referenced above from Section 9 be changed as follows:

> *Although the categorization of avian receptors at the Site is incomplete, no high sensitivity vermivorous species have been observed or are expected at the Site. The specific number of unidentified high sensitivity insectivores, omnivores or herbivores potentially present at the Site has not been determined. Using the available data for sensitivity and the species observed at the Site, the USEPA estimated that between 4 and 17 additional high sensitivity species could be present. These species would not necessarily be at risk, as their feeding strategies would result in lower exposure to PCBs in diet compared to vermivores.*

Specific Comment #:4
Section: Appendix B: TBERA Page #: NA Lines#: NA

EPA recognizes the importance of separating the avian species by their relative sensitivity to the dioxin-like effects of PCBs. However, since not all species observed at the site have been sequenced and assigned to a sensitivity category, EPA believes that inclusion of an estimated number of species that may fall into the sensitive category would be useful in interpreting the risks posed by the site.

Please insert the following after the sentence below from paragraph 1in Section 6.3.7 of the TBERA:

For vermivores, no high sensitivity species have been observed at the Site in over 30 years of surveys conducted by the KRNC. Of the 44 terrestrial (or largely terrestrial) species that have been observed along the Kalamazoo River and for which the AHR genetic sequence has been identified, the gray catbird and the European starling have been identified as being highly sensitive (type 1). *However, a limited number of species has been sequenced to date. Table 2X presents an estimate of the number of Type 1 species that may be present. The analysis indicates that between four and 17 species known to be found at the site are likely Type 1 or highly sensitive.*

Table 2X Confidence Bounds for Percentage and Number of Type-1 (sensitive) Avian Species at Allied Paper Inc/Portage Creek/Kalamazoo River Superfund Site

			Expected Number		Confidence Limits for Percentage Sensitive Species at Kalamazoo River			Confidence Limits for Number Sensitive Species at Kalamazoo River	
Sequenced	Type 1	Observed Percentage	N	Statistical Method	LCL 95	UCL95		LCL 95	UCL95
61	3	5%	8	Hyper-geometric	3%	11%		4	17

Notes:
1) The hypergeometric method (Buonaccorsi 1987) recognizes that a finite number of species have been identified at the site.

Specific Comment #4 Response:

As described in the response to Specific Comment #1, it is proposed that this quantitative analysis be included as a new section in the uncertainty analysis for Risk Characterization (Section 6.2.5.2), with the following suggested edits identified below.

> *For vermivores, no high sensitivity species have been observed at the Site in over 30 years of surveys conducted by the KRNC. Moreover, the Audubon database for the state of Michigan was reviewed and all of the birds with a predominantly vermivorous diet that have been observed in the state have been evaluated and found to be moderate or low sensitivity. Thus, the category of high sensitivity vermivores is not applicable to the Site. Of the 44 terrestrial (or largely terrestrial) species that have been observed along the Kalamazoo River and for which the AHR genetic sequence has been identified, the gray catbird and the European starling (both are insectivores) have been identified as being highly sensitive (type 1). However, a limited number of species has been sequenced to date. Table 2X (below) presents an estimate of the number of Type 1 species that may be present. The analysis indicates that between 4 and 17 insectivorous, omnivorous, or herbivorous species known to be found at the Site may be Type 1, or highly sensitive. These species would not necessarily be at risk, as their feeding strategies would result in lower exposure to PCBs in diet compared to vermivores.*

Table 2X Confidence Bounds for Percentage and Number of Type-1 (sensitive) Avian Species at Allied Paper Inc/Portage Creek/Kalamazoo River Superfund Site

			Expected Number		Confidence Limits for Percentage Sensitive Species at Kalamazoo River			Confidence Limits for Number Sensitive Species at Kalamazoo River	
Sequenced	Type 1	Observed Percentage	N	Statistical Method	LCL 95	UCL95		LCL 95	UCL95
61	3	5%	8	Hyper-geometric	3%	11%		4	17

Notes:
1) The hypergeometric method (Buonaccorsi 1987) recognizes that a finite number of species have been identified at the site.

Specific Comment #:5
Section: Appendix B: TBERA Page #: NA Lines#: NA

After detailed review of the TBERA and SRI, EPA believes that the soil-to-egg bioaccumulation factor (BAF) used in the TBERA for estimating exposure point concentrations is not appropriate. The following presents EPA's rationale. The TBERA reported a BAF of 0.55 and Blankenship (2005) reported a BAF of 0.76. Both analyses exhibit weaknesses that reduce the applicability of the BAF for estimating of RBCs and subsequently preliminary remedial goals.

TBERA Approach
A BAF of 0.55 (egg Total PCBs (ww)/Soil Total PCBs (dw) was reported in the TBERA. The analysis was based on dividing the average egg concentrations (8.2 mg/kg) by the impoundment wide average total PCB concentration (15 mg/kg), resulting in a BAF of 0.55 (8.2/15).

Surface PCB concentrations vary substantially within Trowbridge Impoundment, ranging from less than detection limits to over 40 mg/kg. There are also apparent spatial patterns suggesting that House Wrens with 1-2 acre home ranges would be exposed to something less than the full range of concentrations represented by the impoundment-wide mean. Nesting House wrens would more likely be exposed to the range of the concentrations proximate to the nest box locations.

Blankenship Approach
Studies conducted by Michigan State University (Blankenship et al. 2005) also include estimates of the BAF for House Wren and Eastern Bluebird eggs at Trowbridge Impoundment. A component of the Michigan State studies was also to collect soil samples which were paired/ co- located with biota samples for some species. Blankenship used a grid based sampling approach wherein several samples were

composited to form a more precise estimate of the local mean exposure. The average of these soil grid samples was 6.5 mg/kg (as opposed to the 15 mg/kg used in the TBERA), which resulted in an estimated BAF of 0.76. Blankenship used a ratio of geometric means; however, the ratio of arithmetic averages when samples are not paired is preferred (Burkhard, 2009),

Conclusions

To evaluate the need to pair the egg data with soil data, the nest box locations were plotted on a map with the RI data used in the TBERA and locations of the nest boxes were compared with the closest soil concentrations. In addition, the locations of Blankenship's soil grids were also inspected qualitatively to evaluate how representative they might be relative to the impoundment wide average used in the TBERA. The map of nest box locations and all RI surface soil concentrations are shown in Figure 1 and the locations of Blankenship's soils grids are shown in Figure 2. It can be seen that the nest boxes at the north end of the study area are in close proximity to Blankenship's soil grid location 1. The southern-most nest box is in the vicinity of RI samples with PCB concentrations that range from 0.05 to 0.43 mg/kg. The nest box on the west side of the impoundment is located very close to the floodplain boundary, indicating that exposures to those birds would also be less than the impoundment average due to a site use factor that would likely be less than 1. In total, four of the six house wren nest boxes are proximate to soil concentrations that are much lower than the impoundment wide average, suggesting that the data used by Blankenship may be more representative of exposures than the impoundment wide average. Based on this EPA believes that the Blankenship data can be used to derive a more spatially appropriate BAF. In addition to the BAF, Blankenship also reported the arithmetic mean and standard deviations for the egg and soil data so that BAFs based on arithmetic averages could be recalculated. A 95% UCL for the BAF was also calculated using formulas for the variance of a ratio of random variables (Frishman 1971).

Blankenship reported soil and house wren egg concentrations shown in Table 1 which resulted in an estimated BAF of 1.3 (8.23/6.53; UCL 95= 2.6) which is approximately a factor of 2 higher than that reported in the TBERA. Application of this BAF to estimate an RBC would result in a factor-of-two reduction in the Risk Based Concentration (RBC). For example, for the mid- sensitivity RBC based on the no-observed-adverse effects concentration the RBC would drop from 32 mg/kg to 24.6 based on the mean and 12.3 based on the 95% UCL. EPA believes this approach and specifically the 95% UCL of 2.6 is the more appropriate BAF to use to calculate the RBCs for exposure Approach 2.

Table 1. Arithmetic Average Estimate of BAF based on Blankenship (2005) Data

Soil		House Wren Eggs			
Mean	**Std.**	**Mean**	**Std.**	**BAF**	**95%UCL**
6.53	4.7	**8.23**	8.31	**1.3**	**2.6**
N=21		N=21			

While EPA believes this re-analysis to be important, EPA does not believe it is necessary to re- do the TBERA analysis completely. EPA's concerns can be addressed by adding the following text to the uncertainty section.

Please add the following after the first paragraph of Section 6.2.4.8 of the TBERA:

Studies conducted by Michigan State University (Blankenship et al. 2005) also include estimates of the BAF for House Wren eggs at Trowbridge Impoundment. A component of the Michigan State studies was also to collect soil samples which were paired/co-located with biota samples for some species. Blankenship et al. (2005) used a grid based sampling approach wherein several samples were composited to form a more precise estimate of the local mean exposure. The average of these soil grid samples was 6.5 mg/kg (as opposed to the 15 mg/kg used in the TBERA), which resulted in an estimated BAF of0.76. Blankenship used a ratio of geometric means; however the ratio of arithmetic averages when samples are not paired is preferred (Burkhard, 2009).

Surface PCB concentrations vary; substantially within Trowbridge Impoundment ranging from less than detection limits to over 40 mg/kg. There are also apparent spatial patterns suggesting that House Wrens with 1-2 acre home ranges would be exposed to a something less than the full range of concentrations represented by the impoundment-wide mean. Nesting House Wrens would more likely be exposed to the range of the concentrations proximate to the nest box locations. In addition to the BAF, Blankenship also reported the arithmetic mean and standard deviations for the egg and soil data so that BAFs based on arithmetic averages could be recalculated. A 95% UCL for the BAF was also calculated using formulas for the variance of a ratio of random variables (Frishman 1971).

Blankenship reported soil and house wren egg concentrations shown in Table 1X which resulted in an estimated BAF of 1.3 (8.23/6.53; UCL 95= 2.6) which is approximately a factor of2 higher than that derived by using the impoundment wide averages. Application of the BAF based on the 95% UCL to estimate an RBC would result in a reduction in for example the NOAEL based RBC from 32 mg/kg to 12.3 mg/kg total PCBs and a subsequent change in the HQs

Table 1X. Arithmetic Average Estimate of BAF based on Blankenship (2005) Data

Soil		House Wren Eggs			
Mean	Std.	Mean	Std.	BAF	95%UCL
6.53	4.7	8.23	8.31	1.3	2.6
N=21		N=21			

Specific Comment #5 Response:

It is acknowledged that there are alternative methods for calculating soil to egg BAFs and each has some degree of uncertainty. As such, the following will be added to the uncertainty discussion in Section 6.2.3.3 after the second paragraph (there is no section 6.2.4.8 in the document):

To further evaluate this uncertainty, two alternative approaches are considered. One relies on all available soil data to develop spatially interpolated estimates of mean soil concentrations around each nest box within the estimated house wren foraging area of 2 acres. The second, conducted by USEPA, uses the mean and standard deviation of soil data collected by MSU within four sampling grids to estimate soil concentrations. The BAF used in the TBERA falls within the resulting BAFs from the two alternative approaches.

The first approach calculates estimated soil concentrations using spatially interpolated surface soil concentrations. The spatially interpolated surface was created using a natural neighbor approach consistent with the approach employed to estimate soil EPCs for Area 1. Both the 1993/94 data collected for the Site-wide RI (BBL 1994) and the data collected from the grids by MSU (used in the USEPA approach, described below) were used in the interpolation (see Figure 1,attached). A mean concentration within a 2-acre area around each nest box where eggs were collected was calculated using the natural neighbor surface. These mean soil concentrations were then used along with egg data from each nest to develop a range of possible BAFs. When multiple eggs were collected from a nest, the egg concentrations were averaged. Based on the interpolated mean soil concentration and associated egg concentrations for each nest where eggs were collected[1], the range of house wren BAFs is 0.06 to 1.7 (egg total PCBs [ww]/soil total PCBs [dw]), with a median BAF for house wren eggs of 0.44 (Table 2 – attached). This estimated value is 20% lower than the BAF value of 0.55 used to estimate egg concentrations for the egg-based HQ calculations as described in Section 4.5.5. Application of this median BAF to estimate an RBC would result in an approximately 20% increase in RBCs (e.g., the NOAEL based RBC would go from 43 mg/kg to 53 mg/kg total PCBs) with a similar magnitude of decrease in the HQs.

The second approach, conducted by USEPA, included the soil data from studies conducted by Michigan State University (Blankenship et al. 2005) as well as the house wren eggs collected from these studies. The MSU researchers included estimates of the BAF for house wren eggs from the former Trowbridge Impoundment. A component of the Michigan State studies was also to collect soil samples which were paired/co-located with biota samples for some species. Blankenship et al. (2005) used a grid based sampling approach wherein several samples were composited to form a more precise estimate of the local mean exposure; however, these grid locations were not co-located with house wren nest boxes from which eggs were collected (Figure 2 below). The average PCB concentration of these soil grid samples was 6.5 mg/kg (as opposed to the 15 mg/kg used in the TBERA), which resulted in an estimated BAF of 0.76. Blankenship et al. used a ratio of geometric means; however, the ratio of arithmetic averages when samples are not paired is preferred (Burkhard 2009).

[1] When multiple eggs were collected from the same nest box, egg concentrations were averaged.

Surface PCB concentrations vary substantially within the former Trowbridge Impoundment, ranging from less than detection limits to over 40 mg/kg. There are also apparent spatial patterns suggesting that house wrens with 1-2 acre home ranges would be exposed to a something less than the full range of concentrations represented by the impoundment-wide mean. Nesting house wrens would more likely be exposed to the range of the concentrations proximate to the nest box locations. In addition to the BAF, Blankenship et al. also reported the arithmetic mean and standard deviations for the egg and soil data so that BAFs based on arithmetic averages could be recalculated. A 95% UCL for the BAF was also calculated using formulas for the variance of a ratio of random variables (Frishman 1971).

Blankenship reported soil and house wren egg concentrations (shown in Table 1X, below) which resulted in an estimated BAF of 1.3 (8.23/6.53; UCL 95 = 2.6) which is approximately a factor of 2 higher than that derived by using the impoundment-wide averages. Application of the BAF based on the 95% UCL to estimate an RBC would result in a reduction in the NOAEL-based RBC from 43 mg/kg to 9 mg/kg total PCBs and a similar magnitude increase in the HQs.

Table 1X. Arithmetic Average Estimate of BAF based on Blankenship (2005) Data

Soil		House Wren Eggs			
Mean	Std.	Mean	Std.	BAF	95%UCL
6.53	4.7	8.23	8.31	1.3	2.6
N=21		N=21			

References

Buonaccorsi, John P., 1987. Reviewed A Note on Confidence Intervals for Proportions in Finite Populations. The American Statistician, Vol. 41, No.3 (Aug., 1987), pp.215-218.

Burkhard, L. 2009. Estimation of Biota Sediment Accumulation Factor (BSAF) from Paired Observations of Chemical Concentrations in Biota and Sediment. U.S. Environmental Protection Agency, Ecological Risk Assessment Support Center, Cincinnati, OH. EPA/600/R-06/ 047.

Frishman, F. Ort the Arithmetic Means and Variances of Products and Ratios of Random Variables. Army Research Office, Durham, North Carolina. NTIS. AD-785-623. 5285 Port Royal Rd, Springfield Va. 22151

Michigan Audubon Records Committee, Official Checklist of Michigan Birds, updated May 5 , 2012. Accessed at http://www.michiganaudubon.org/research/recordscommittee/michigan_checklist.html

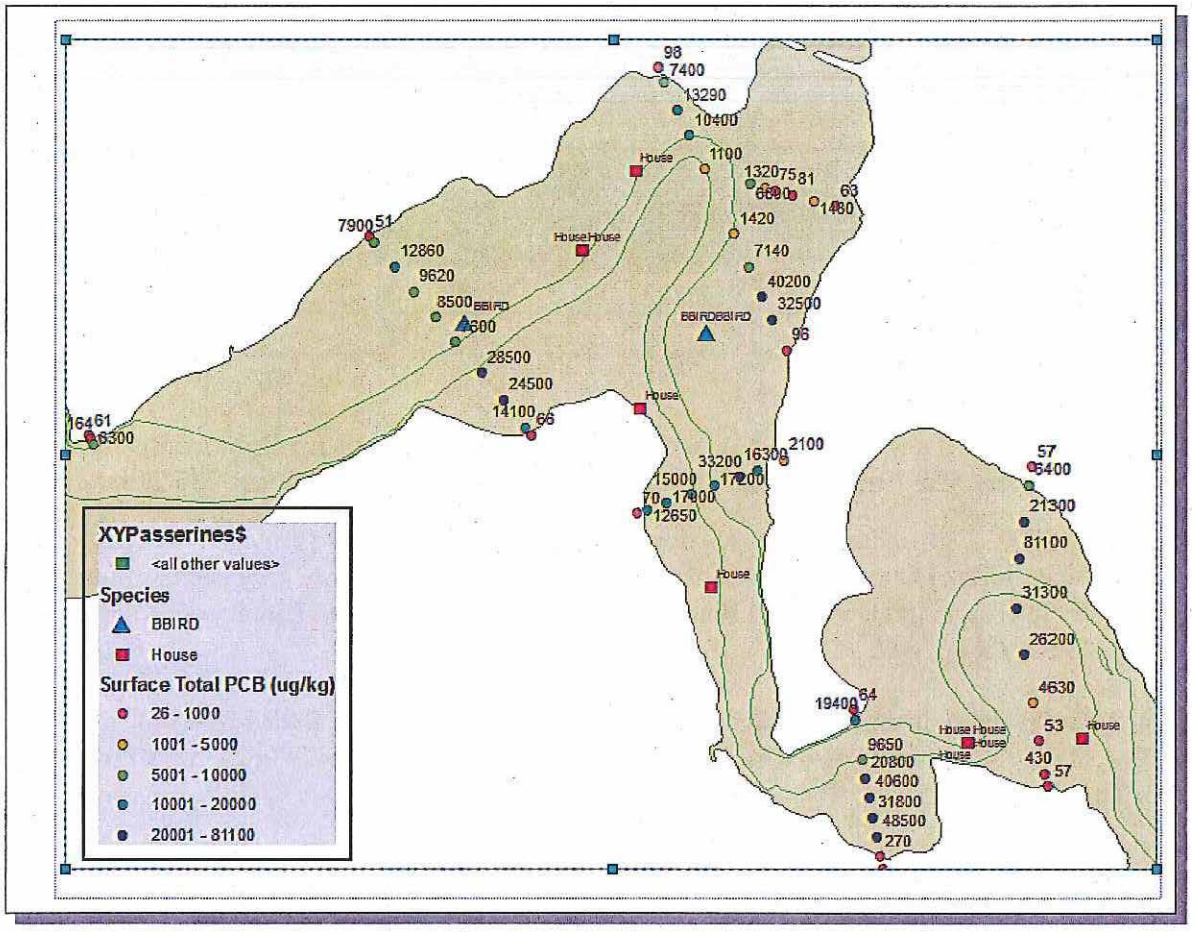

Figure 1. Surface soil total PCB concentrations and nest box locations.

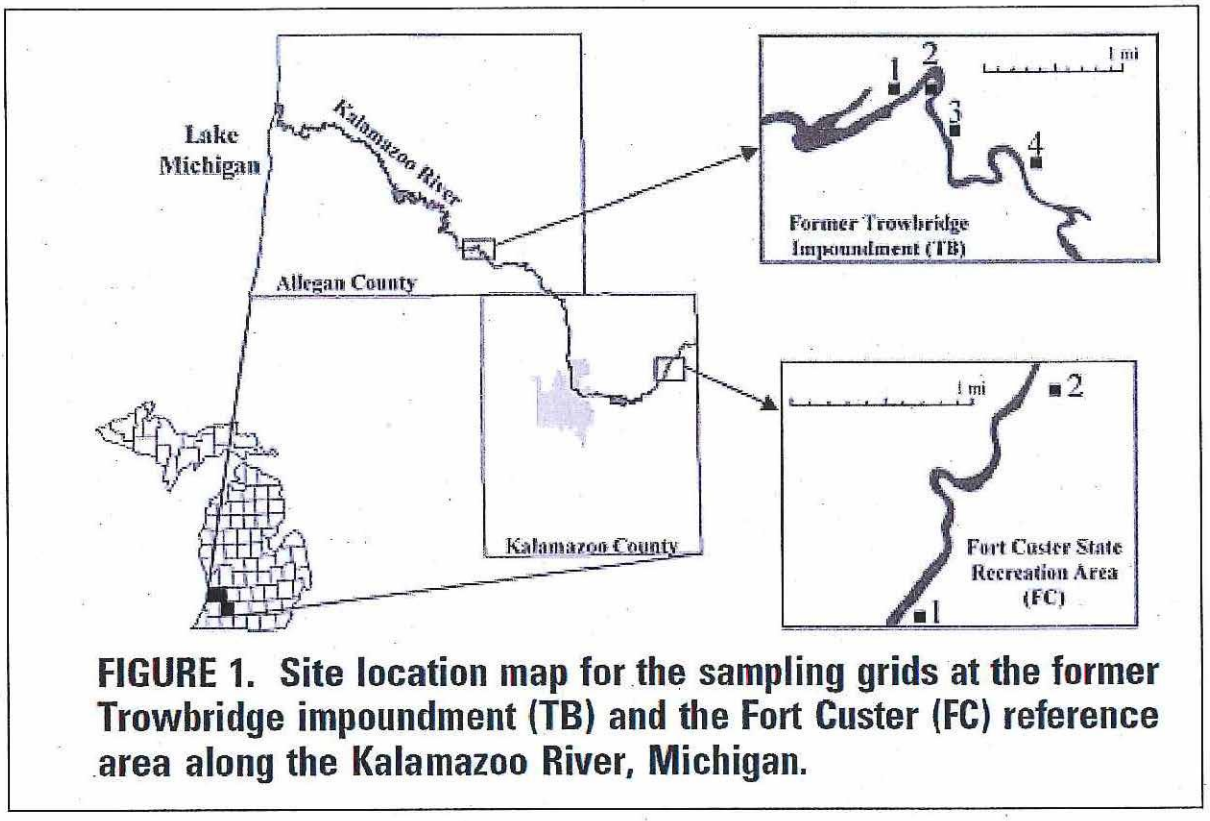

FIGURE 1. Site location map for the sampling grids at the former Trowbridge impoundment (TB) and the Fort Custer (FC) reference area along the Kalamazoo River, Michigan.

Figure 2. Location of terrestrial soil sampling grids (Excerpted from Blankenship, 2005).

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RTC Attachment 1

Table 1 -- Bird Species Found in the State of Michigan

Georgia-Pacific LLC
Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Supplemental Remedial Investigations/Feasibility Studies
Area 1 Supplemental Remedial Investigation Report

Table 1 -- Bird Species Found in the State of Michigan

Michigan Bird Species	Vermivorous?
Primarily Terrestrial	
American Woodcock, Scolopax minor	Yes
American Robin, Turdus migratorius	Yes
Wilson's Snipe, Gallinago delicata	No
Wood Thrush, Hylocichla mustelina	No
Northern Mockingbird, Mimus polyglottos	No
European Starling, Sturnus vulgaris (Introduced)	No
Scarlet Tanager, Piranga olivacea	No
Northern Bobwhite, Colinus virginianus	No
Ring-necked Pheasant, Phasianus colchicus	No
Ruffed Grouse, Bonasa umbellus	No
Spruce Grouse, Falcipennis canadensis	No
Sharp-tailed Grouse, Tympanuchus phasianellus	No
Wild Turkey, Meleagris gallopavo	No
Cattle Egret, Bubulcus ibis	No
Black Vulture, Coragyps atratus	No
Turkey Vulture, Cathartes aura	No
Osprey, Pandion haliaetus	No
Swallow-tailed Kite, Elanoides forficatus [Casual]	No
Mississippi Kite, Ictinia mississippiensis [Casual]	No
Bald Eagle, Haliaeetus leucocephalus	No
Northern Harrier, Circus cyaneus	No
Sharp-shinned Hawk, Accipiter striatus	No
Cooper's Hawk, Accipiter cooperii	No
Northern Goshawk, Accipiter gentilis	No
Red-shouldered Hawk, Buteo lineatus	No
Broad-winged Hawk, Buteo platypterus	No
Swainson's Hawk, Buteo swainsoni	No
Red-tailed Hawk, Buteo jamaicensis	No
Rough-legged Hawk, Buteo lagopus	No
Golden Eagle, Aquila chrysaetos	No
American Kestrel, Falco sparverius	No
Merlin, Falco columbarius	No
Gyrfalcon, Falco rusticolus	No
Peregrine Falcon, Falco peregrinus	No
Prairie Falcon, Falco mexicanus [Casual]	No
Sandhill Crane, Grus canadensis	No
Rock Pigeon, Columba livia	No
Eurasian Collared-Dove, Streptopelia decaocto	No
White-winged Dove, Zenaida asiatica [Casual]	No
Mourning Dove, Zenaida macroura	No
Yellow-billed Cuckoo, Coccyzus americanus	No
Black-billed Cuckoo, Coccyzus erythropthalmus	No
Barn Owl, Tyto alba [Casual]	No
Eastern Screech-Owl, Megascops asio	No
Great Horned Owl, Bubo virginianus	No
Snowy Owl, Bubo scandiacus	No
Northern Hawk Owl, Surnia ulula	No
Barred Owl, Strix varia	No
Great Gray Owl, Strix nebulosa	No
Long-eared Owl, Asio otus	No
Short-eared Owl, Asio flammeus	No
Boreal Owl, Aegolius funereus	No
Nothern Saw-whet Owl, Aegolius acadicus	No
Common Nighthawk, Chordeiles minor	No
Chuck-will's-widow, Caprimulgus carolinensis [Casual]	No

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Michigan Bird Species	Vermivorous?
Eastern Whip-poor-will, Caprimulgus vociferus	No
Chimney Swift, Chaetura pelagica	No
Green Violetear, Colibri thalassinus [Casual]	No
Ruby-throated Hummingbird, Archilochus colubris	No
Rufous Hummingbird, Selasphorus rufus	No
Belted Kingfisher, Megaceryle alcyon	No
Red-headed Woodpecker, Melanerpes erythrocephalus	No
Red-bellied Woodpecker, Melanerpes carolinus	No
Yellow-bellied Sapsucker, Sphyrapicus varius	No
Downy Woodpecker, Picoides pubescens	No
Hairy Woodpecker, Picoides villosus	No
American Three-toed Woodpecker, Picoides dorsalis [Casual]	No
Black-backed Woodpecker, Picoides arcticus	No
Northern Flicker, Colaptes auratus	No
Pileated Woodpecker, Dryocopus pileatus	No
Olive-sided Flycatcher, Contopus cooperi	No
Eastern Wood-Pewee, Contopus virens	No
Yellow-bellied Flycatcher, Empidonax flaviventris	No
Acadian Flycatcher, Empidonax virescens	No
Alder Flycatcher, Empidonax alnorum	No
Willow Flycatcher, Empidonax traillii	No
Least Flycatcher, Empidonax minimus	No
Eastern Phoebe, Sayornis phoebe	No
Say's Phoebe, Sayornis saya [Casual]	No
Great Crested Flycatcher, Myiarchus crinitus	No
Western Kingbird, Tyrannus verticalis	No
Eastern Kingbird, Tyrannus tyrannus	No
Scissor-tailed Flycatcher, Tyrannus forficatus	No
Loggerhead Shrike, Lanius ludovicianus [Casual]	No
Northern Shrike, Lanius excubitor	No
White-eyed Vireo, Vireo griseus	No
Bell's Vireo, Vireo bellii [Casual]	No
Yellow-throated Vireo, Vireo flavifrons	No
Blue-headed Vireo, Vireo solitarius	No
Warbling Vireo, Vireo gilvus	No
Philadelphia Vireo, Vireo philadelphicus	No
Red-eyed Vireo, Vireo olivaceus	No
Gray Jay, Perisoreus canadensis	No
Blue Jay, Cyanocitta cristata	No
Clark's Nutcracker, Nucifraga columbiana [Accidental, sight record only]	No
Black-billed Magpie, Pica hudsonia [Casual]	No
American Crow, Corvus brachyrhynchos	No
Common Raven, Corvus corax	No
Horned Lark, Eremophila alpestris	No
Purple Martin, Progne subis	No
Tree Swallow, Tachycineta bicolor	No
Northern Rough-winged Swallow, Stelgidopteryx serripennis	No
Bank Swallow, Riparia riparia	No
Cliff Swallow, Petrochelidon pyrrhonota	No
Cave Swallow, Petrochelidon fulva [Casual]	No
Barn Swallow, Hirundo rustica	No
Black-capped Chickadee, Poecile atricapillus	No
Boreal Chickadee, Poecile hudsonicus	No
Tufted Titmouse, Baeolophus bicolor	No
Red-breasted Nuthatch, Sitta canadensis	No
White-breasted Nuthatch, Sitta carolinensis	No

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Michigan Bird Species	Vermivorous?
Brown Creeper, Certhia americana	No
Rock Wren, Salpinctes obsoletus [Casual]	No
Carolina Wren, Thryothorus ludovicianus	No
House Wren, Troglodytes aedon	No
Winter Wren, Troglodytes hiemalis	No
Sedge Wren, Cistothorus platensis	No
Marsh Wren, Cistothorus palustris	No
Blue-gray Gnatcatcher, Polioptila caerulea	No
Golden-crowned Kinglet, Regulus satrapa	No
Ruby-crowned Kinglet, Regulus calendula	No
Eastern Bluebird, Sialia sialis	No
Mountain Bluebird, Sialia currucoides [Casuall]	No
Townsend's Solitaire, Myadestes townsendi	No
Veery, Catharus fuscescens	No
Gray-cheeked Thrush, Catharus minimus	No
Swainson's Thrush, Catharus ustulatus	No
Hermit Thrush, Catharus guttatus	No
Varied Thrush, Ixoreus naevius	No
Gray Catbird, Dumetella carolinensis	No
Brown Thrasher, Toxostoma rufum	No
American Pipit, Anthus rubescens	No
Bohemian Waxwing, Bombycilla garrulus	No
Cedar Waxwing, Bombycilla cedrorum	No
Lapland Longspur, Calcarius lapponicus	No
Smith's Longspur, Calcarius pictus [Casual]	No
Snow Bunting, Plectrophenax nivalis	No
Ovenbird, Seiurus aurocapilla	No
Worm-eating Warbler, Helmitheros vermivorum	No
Louisiana Waterthrush, Parkesia motacilla	No
Northern Waterthrush, Parkesia noveboracensis	No
Golden-winged Warbler, Vermivora chrysoptera	No
Blue-winged Warbler, Vermivora cyanoptera	No
Black-and-white Warbler, Mniotilta varia	No
Prothonotary Warbler, Protonotaria citrea	No
Tennessee Warbler, Oreothlypis peregrina	No
Orange-crowned Warbler, Oreothlypis celata	No
Nashville Warbler, Oreothlypis ruficapilla	No
Connecticut Warbler, Oporornis agilis	No
Mourning Warbler, Geothlypis philadelphia	No
Kentucky Warbler, Geothlypis formosa	No
Common Yellowthroat, Geothlypis trichas	No
Hooded Warbler, Setophaga citrina	No
American Redstart, Setophaga ruticilla	No
Kirtland's Warbler, Setophaga kirtlandii	No
Cape May Warbler, Setophaga tigrina	No
Cerulean Warbler, Setophaga cerulea	No
Northern Parula, Setophaga americana	No
Magnolia Warbler, Setophaga magnolia	No
Bay-breasted Warbler, Setophaga castanea	No
Blackburnian Warbler, Setophaga fusca	No
Yellow Warbler, Setophaga petechia	No
Chestnut-sided Warbler, Setophaga pensylvanica	No
Blackpoll Warbler, Setophaga striata	No
Black-throated Blue Warbler, Setophaga caerulescens	No
Palm Warbler, Setophaga palmarum	No
Pine Warbler, Setophaga pinus	No

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Michigan Bird Species	Vermivorous?
Yellow-rumped Warbler, Setophaga coronata	No
Yellow-throated Warbler, Setophaga dominica	No
Prairie Warbler, Setophaga discolor	No
Black-throated Green Warbler, Setophaga virens	No
Canada Warbler, Cardellina canadensis	No
Wilson's Warbler, Cardellina pusilla	No
Yellow-breasted Chat, Icteria virens	No
Green-tailed Towhee, Pipilo chlorurus [Casual]	No
Spotted Towhee, Pipilo maculatus [Casual]	No
Eastern Towhee, Pipilo erythrophthalmus	No
American Tree Sparrow, Spizella arborea	No
Chipping Sparrow, Spizella passerina	No
Clay-colored Sparrow, Spizella pallida	No
Field Sparrow, Spizella pusilla	No
Vesper Sparrow, Pooecetes gramineus	No
Lark Sparrow, Chondestes grammacus	No
Lark Bunting, Calamospiza melanocorys [Casual]	No
Savannah Sparrow, Passerculus sandwichensis	No
Grasshopper Sparrow, Ammodramus savannarum	No
Henslow's Sparrow, Ammodramus henslowii	No
Le Conte's Sparrow, Ammodramus leconteii	No
Nelson's Sparrow, Ammodramus nelsoni [Casual]	No
Fox Sparrow, Passerella iliaca	No
Song Sparrow, Melospiza melodia	No
Lincoln's Sparrow, Melospiza lincolnii	No
Swamp Sparrow, Melospiza georgiana	No
White-throated Sparrow, Zonotrichia albicollis	No
Harris's Sparrow, Zonotrichia querula	No
White-crowned Sparrow, Zonotrichia leucophrys	No
Dark-eyed Junco, Junco hyemalis	No
Summer Tanager, Piranga rubra	No
Western Tanager, Piranga ludoviciana [Casual]	No
Northern Cardinal, Cardinalis cardinalis	No
Rose-breasted Grosbeak, Pheucticus ludovicianus	No
Blue Grosbeak, Passerina caerulea [Casual]	No
Indigo Bunting, Passerina cyanea	No
Painted Bunting, Passerina ciris	No
Dickcissel, Spiza americana	No
Bobolink, Dolichonyx oryzivorus	No
Red-winged Blackbird, Agelaius phoeniceus	No
Eastern Meadowlark, Sturnella magna	No
Western Meadowlark, Sturnella neglecta	No
Yellow-headed Blackbird, Xanthocephalus xanthocephalus	No
Rusty Blackbird, Euphagus carolinus	No
Brewer's Blackbird, Euphagus cyanocephalus	No
Common Grackle, Quiscalus quiscula	No
Brown-headed Cowbird, Molothrus ater	No
Orchard Oriole, Icterus spurius	No
Bullock's Oriole, Icterus bullockii [Casual]	No
Baltimore Oriole, Icterus galbula	No
Pine Grosbeak, Pinicola enucleator	No
Purple Finch, Carpodacus purpureus	No
House Finch, Carpodacus mexicanus	No
Red Crossbill, Loxia curvirostra	No
White-winged Crossbill, Loxia leucoptera	No
Common Redpoll, Acanthis flammea	No

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Hoary Redpoll, Acanthis hornemanni	No
Pine Siskin, Spinus pinus	No
American Goldfinch, Spinus tristis	No
Evening Grosbeak, Coccothraustes vespertinus	No
House Sparrow, Passer domesticus	No
Eurasian Tree Sparrow, Passer montanus [Casual]	No
Primarily Aquatic	
Killdeer, Charadrius vociferous	Yes
Glossy Ibis, Plegadis falcinellus [Casual]	Yes
White-faced Ibis, Plegadis chihi [Casual]	Yes
Short-billed Dowitcher, Limnodromus griseus	Yes
Long-billed Dowitcher, Limnodromus scolopaceus	Yes
Black-bellied Plover, Pluvialis squatarola	Yes
American Golden-Plover, Pluvialis dominica	Yes
Semipalmated Plover, Charadrius semipalmatus	Yes
Piping Plover, Charadrius melodus	Yes
Mallard, Anas platyrhynchos	No
Horned Grebe, Podiceps auritus	No
Green Heron, Butorides virescens	No
Black-crowned Night-Heron, Nycticorax nycticorax	No
Yellow-crowned Night-Heron, Nyctanassa violacea	No
Spotted Sandpiper, Actitis macularius	No
Greater Yellowlegs, Tringa melanoleuca	No
Willet, Tringa semipalmata	No
Lesser Yellowlegs, Tringa flavipes	No
Dunlin, Calidris alpina	No
Greater White-fronted Goose, Anser albifrons	No
Snow Goose, Chen caerulescens	No
Ross's Goose, Chen rossii	No
Brant, Branta bernicla [Casual]	No
Cackling Goose, Branta hutchinsii	No
Canada Goose, Branta canadensis	No
Mute Swan, Cygnus olor	No
Trumpeter Swan, Cygnus buccinator	No
Tundra Swan, Cygnus columbianus	No
Wood Duck, Aix sponsa	No
Gadwall, Anas strepera	No
Eurasian Wigeon, Anas penelope [Casual]	No
American Wigeon, Anas americana	No
American Black Duck, Anas rubripes	No
Blue-winged Teal, Anas discors	No
Northern Shoveler, Anas clypeata	No
Northern Pintail, Anas acuta	No
Green-winged Teal, Anas crecca	No
Canvasback, Aythya valisineria	No
Redhead, Aythya americana	No
Greater Scaup, Aythya marila	No
Lesser Scaup, Aythya affinis	No
King Eider, Somateria spectabilis [Casual]	No
Harlequin Duck, Histrionicus histrionicus	No
Surf Scoter, Melanitta perspicillata	No
White-winged Scoter, Melanitta fusca	No
Black Scoter, Melanitta americana	No
Long-tailed Duck, Clangula hyemalis	No
Bufflehead, Bucephala albeola	No
Common Goldeneye, Bucephala clangula	No

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Michigan Bird Species	Vermivorous?
Barrow's Goldeneye, Bucephala islandica [Casual]	No
Hooded Merganser, Lophodytes cucullatus	No
Common Merganser, Mergus merganser	No
Red-breasted Merganser, Mergus serrator	No
Ruddy Duck, Oxyura jamaicensis	No
Red-throated Loon, Gavia stellata	No
Pacific Loon, Gavia pacifica	No
Common Loon, Gavia immer	No
Pied-billed Grebe, Podilymbus podiceps	No
Red-necked Grebe, Podiceps grisegena	No
Eared Grebe, Podiceps nigricollis	No
Western Grebe, Aechmophorus occidentalis [Casual]	No
Northern Gannet, Morus bassanus [Casual]	No
Double-crested Cormorant, Phalacrocorax auritus	No
American White Pelican, Pelecanus erythrorhynchos	No
Brown Pelican, Pelecanus occidentalis [Casual]	No
American Bittern, Botaurus lentiginosus	No
Least Bittern, Ixobrychus exilis	No
Great Blue Heron, Ardea herodias	No
Great Egret, Ardea alba	No
Snowy Egret, Egretta thula	No
Little Blue Heron, Egretta caerulea	No
Tricolored Heron, Egretta tricolor [Casual]	No
Yellow Rail, Coturnicops noveboracensis	No
King Rail, Rallus elegans [Casual]	No
Virginia Rail, Rallus limicola	No
Sora, Porzana carolina	No
Common Gallinule, Gallinula galeata	No
American Coot, Fulica americana	No
Black-necked Stilt, Himantopus mexicanus [Casual]	No
American Avocet, Recurvirostra americana	No
Solitary Sandpiper, Tringa solitaria	No
Upland Sandpiper, Bartramia longicauda	No
Whimbrel, Numenius phaeopus	No
Hudsonian Godwit, Limosa haemastica	No
Marbled Godwit, Limosa fedoa	No
Ruddy Turnstone, Arenaria interpres	No
Red Knot, Calidris canutus	No
Sanderling, Calidris alba	No
Semipalmated Sandpiper, Calidris pusilla	No
Western Sandpiper, Calidris mauri [Casual]	No
Least Sandpiper, Calidris minutilla	No
White-rumped Sandpiper, Calidris fuscicollis	No
Baird's Sandpiper, Calidris bairdii	No
Pectoral Sandpiper, Calidris melanotos	No
Purple Sandpiper, Calidris maritima	No
Stilt Sandpiper, Calidris himantopus	No
Buff-breasted Sandpiper, Tryngites subruficollis	No
Wilson's Phalarope, Phalaropus tricolor	No
Red-necked Phalarope, Phalaropus lobatus	No
Red Phalarope, Phalaropus fulicarius [Casual]	No
Black-legged Kittiwake, Rissa tridactyla	No
Sabine's Gull, Xema sabini	No
Bonaparte's Gull, Chroicocephalus philadelphia	No
Little Gull, Hydrocoloeus minutus	No
Laughing Gull, Leucophaeus atricilla	No

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Franklin's Gull, Leucophaeus pipixcan	No
Ring-billed Gull, Larus delawarensis	No
California Gull, Larus californicus [Casual]	No
Herring Gull, Larus argentatus	No
Thayer's Gull, Larus thayeri	No
Iceland Gull, Larus glaucoides	No
Lesser Black-backed Gull, Larus fuscus	No
Glaucous Gull, Larus hyperboreus	No
Great Black-backed Gull, Larus marinus	No
Least Tern, Sternula antillarum [Casual]	No
Caspian Tern, Hydroprogne caspia	No
Black Tern, Chlidonias niger	No
Common Tern, Sterna hirundo	No
Arctic Tern, Sterna paradisaea [Casual]	No
Forster's Tern, Sterna forsteri	No
Pomarine Jaeger, Stercorarius pomarinus [Casual]	No
Parasitic Jaeger, Stercorarius parasiticus	No
Long-tailed Jaeger, Stercorarius longicaudus [Casual]	No
Dovekie, Alle alle [Accidental]	No
Ancient Murrelet, Synthliboramphus antiquus [Casual]	No

Species recorded fewer than four times in the last ten years were excluded from this list.

Sources:

Michigan Audubon Records Committee. May 5, 2012. Official Checklist of Michigan Birds. Accessed at http://www.michiganaudubon.org/research/recordscommittee/michigan_checklist.html

Cornell Lab of Ornithology and American Ornithologists Union. The Birds of North America Online. Accessed at http://.birds.cornell.edu

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RTC Attachment 2

Table 2 -- Bioaccumulation Factors Based on Mean House Wren Egg and Associated Soil Concentrations Within a 2 acre Foraging Range

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Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
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Table 2 -- Bioaccumulation Factors Based on Mean House Wren Egg and Associated Soil Concentrations Within a 2 acre Foraging Range

Nest Box ID	Egg Concentration (mg/kg)	Average Egg Concentration per nest box (mg/kg)	Mean Interpolated Soil Concentration	BAF
69	0.46	0.46	7.67	0.06
81	6.25	6.25	4.34	1.4
108	3.96	3.96	11.54	0.34
114	6.77			
114	6.15			
114	8.13			
114	6.19			
114	6.28	6.70	22.11	0.28
115	26.10			
115	8.17			
115	1.96			
115	36.30			
115	14.70	17.45	8.82	1.7
120	6.59	6.59	21.74	0.30
125	3.23	3.23	10.42	0.31
134	5.75			
134	8.28	7.02	7.27	1.1
136	5.09	5.09	5.60	0.91
137	3.88	3.88	5.78	0.67
146	3.13	3.13	21.32	0.15
0	5.41	5.41	10.03	0.54
			median	0.44
			min	0.06
			max	1.7

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RTC Attachment 3

Figure 1 -

House Wren Nest Box Locations and Spatially Interpolated PCB Surface Soil Concentrations

SYR-90 SP B.Stiteler
KRSG (B0064539.0001.00500)
Q:\KRSG\PlainwellDamToTrowbridgeDam\EPAResponseToComments\mxd\PCB_NN_estimate_wrenBox_2AcreBuffer_rotatev2.mxd - 7/10/2012 @ 1:03:18 PM

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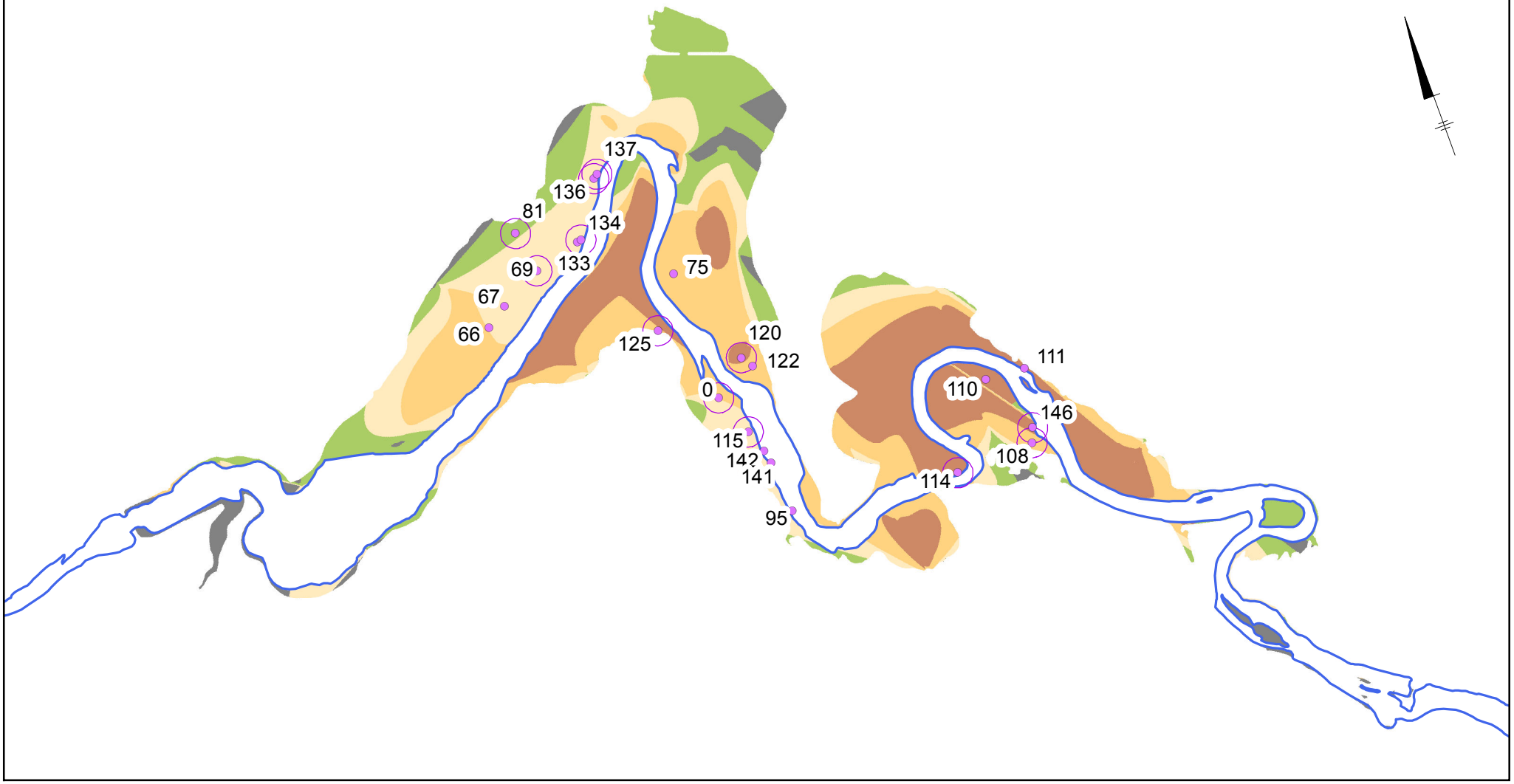

LEGEND:

MEAN PCB (MG/KG)
- ≤ 1
- >1 and ≤ 5
- >5 and ≤ 10
- >10 and ≤ 20
- > 20

HOUSE WREN BOX LOCATIONS

KALAMAZOO RIVER

2-ACRE AREA AROUND NEST BOXES FROM WHICH EGGS WERE SAMPLED

0 2,000 4,000 Feet

GRAPHIC SCALE

GEORGIA PACIFIC, LLC ALLIED PAPER, INC./
PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
FORMER TROWBRIDGE IMPOUNDMENT

HOUSE WREN NEST BOX LOCATIONS AND SPATIALLY INTERPOLATED PCB SURFACE SOIL CONCENTRATIONS

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FIGURE
1